3M™ Dyneon™ Fluoroplastics

Adding value to complex geometries.

Fluorothermoplastic Product Introduction Guide.
Melt processing for challenging applications.

Industries such as chemical processing, wire and cable, construction, oil and gas, transportation, and semiconductor manufacturing constantly strive to optimize equipment service life and minimize maintenance and operating costs. By addressing these needs with a broad line of specially designed 3M™ Dyneon™ Fluoroplastics, 3M remains in the forefront of developing new solutions for challenging applications.

From our low-temperature processable THV products to our high temperature-resistant PFA and FEP materials, our fluoroplastics are engineered for efficiency – helping you meet the challenges of your industry.

This brochure contains information to help you explore our range of innovative products. In addition, our expert technical and support teams will work directly with you to identify the optimal solution for your application.
When you’re investigating new materials and new or improved manufacturing processes, you want to make the most of your materials – and of your team’s valuable time. That is where 3M’s technical specialists in application engineering (AE) can help.

Our fluorothermoplastic specialists are always available to help you select and process our materials (including new grades) and to ensure a smooth transition into your manufacturing process.

Our worldwide research facilities have most types of fluorothermoplastic processing equipment. From start-up manufacturing to troubleshooting existing lines, we have the equipment and the expertise to support you every step of the way.

In addition, we can help in developing, prototyping, and testing your products. Contact our field personnel in over 50 countries to get valuable technical assistance.
**Extrusion**

The objective of efficient production is a stable process with optimized yield. It is critical to adjust the process parameters to suit the best material for the application. The extrusion equipment itself is equally important: corrosion protection, temperature management, screw geometry, die surface quality and other factors must be considered.

Our technical service experts can help you optimize your extrusion processing for 3M™ Dyneon™ Fluoroplastics to enable the efficient production of films, sheets, tubes, rods, filaments, or any type of wire and cable.

**Injection molding**

An efficient and reliable process is key for cost effective mass production. Using the right equipment, with all relevant parts protected from corrosion, will enhance both the equipment service life and production efficiency. Injection molding requires accuracy: the material used for the part, the desired shape and features of the part, the material of the mold, and the properties of the molding machine must all be taken into account. Optimizing your injection molding processing for these design considerations opens new possibilities for this already versatile process.

For more details, please see our comprehensive “Injection Molding Guide” brochure.

**Transfer molding**

When metal parts have to be corrosion protected, transfer molding may be the process of choice for the lining of the metal.

The molding material is plastified and then forced through channels into the mold cavity. This process can be executed traditionally with a melting pot mounted on a tool in a press or semi-automated/fully automated including an extruder.

For more information on extrusion, injection molding and transfer molding processes, watch our technical animations online: www.dyneon.eu/videos

**Coatings and impregnation**

We offer a wide range of coating and impregnation solutions, including micropowders, multiple types of dispersions, PFA electrostatic coatings and more. These innovative products are optimized for quality and reliability and are engineered to give you greater freedom of design.

For more details, please see our comprehensive “Innovative and Sustainable Coating Solutions” brochure.

*Available at www.dyneon.eu/brochures*
**3M™ Dyneon™ Fluoroplastic PFA.**

Fluorothermoplastic PFA (a polymer containing tetrafluoroethylene and perfluorovinylether) has exceptional heat resistance, excellent electrical properties, and excellent chemical and weather resistance. It is used in molded valves, pumps, tanks, filters and pipes, in heat trace cable appliances, computers, and in the aerospace industry. It is also used in several chemical industry and home appliance coating applications. In addition, we have expanded this product line to include ultra high purity (UHP) grades for applications requiring low metal/anion extractables and low outgassing. In particular, the semiconductor market has chosen PFA as the material of choice for wafer carriers, tubings, fittings, pump parts, and other components. Other sectors, such as the pharmaceutical and biotechnology industries, can also benefit from these materials.

Dyneon Fluoroplastic PFA is characterized by the following features:

- Wide service temperature range
- Excellent universal resistance to solvents and chemicals
- Outstanding mechanical properties
- Extremely high weathering resistance and UV stability
- Excellent electrical properties
- High light transmission
- High limiting oxygen index: does not support combustion
- Extremely smooth surfaces
- Non-stick characteristics
- Good low-friction properties

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<tr>
<th>Categories of PFA grades</th>
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<tr>
<td>- Improved adhesion to metal</td>
<td>- Easy demolding (release)</td>
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<tr>
<td>FLEX</td>
<td>- Extremely high stress crack resistance</td>
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<td>- Improved stress crack resistance</td>
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<td>UHP</td>
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Fluorothermoplastic FEP (a polymer containing tetrafluoroethylene and hexafluoropropylene) offers excellent chemical inertness, heat and weather resistance, exceptional electrical properties, toughness, and durability. It is an essential component in films, linings, tapes, wires, and cables in a variety of industries including telecommunications, construction, automotive/transport, electrical and electronic, energy, and oil and gas.

Dyneon Fluoroplastic FEP is characterized by the following features:

- Wide service temperature range
- Excellent resistance to solvents and chemicals
- Outstanding electrical properties
- High limiting oxygen index: does not support combustion
- Extremely smooth surface

Fluorothermoplastic ETFE (a polymer containing tetrafluoroethylene and ethylene) has excellent chemical, thermal, and electrical properties, as well as superior resistance to abrasion and cut-through. It is essential in a number of industries such as aerospace, automotive, and chemical processing. Applications include wiring for nuclear plant control rooms, extruded and molded valves, tubes and pipes, low permeation tubing, radiation resistant film, and architectural films.

Dyneon Fluoroplastic ETFE is characterized by the following features:

- Wide service temperature range
- Low flammability
- Excellent electrical and mechanical properties
- Very good resistance to solvents and chemicals
- Extremely high resistance to outdoor weathering
- High light transmission in the visible and UV ranges
- Non-stick characteristics
- Excellent tear resistance
- Good stress crack resistance
- Low permeability
- Good resistance to radiation
3M™ Dyneon™ Fluoroplastic THV.

Fluorothermoplastic THV (a polymer containing tetrafluoroethylene, hexafluoropropylene, and vinylidene fluoride) provides a combination of performance advantages unmatched by any other melt processable fluorothermoplastic, offering new opportunities to make multi-layer hoses, tubes, film, sheet, seals, and containers. These products are used in a variety of markets and applications such as automotive (low-permeation fuel systems), chemical processing, semiconductor, solar energy, polymer optical fiber, architectural, and protective coatings.

Dyneon Fluoroplastic THV is characterized by the following features:

- Relatively low temperature processing with a wide processing window for:
  - extrusion, coextrusion, injection molding, and blow molding
  - film laminating
  - coating and compounding
- Unmatched flexibility relative to other fluorothermoplastics
- Chemical resistance to broad classes of chemicals such as inorganic and organic acids, halogen compounds, hydrocarbons, and alcohols
- Excellent permeation resistance to hydrocarbon, “flex” fuels, and other aggressive chemicals
- Exceptional optical clarity and transmittance, particularly in the UV and visible regions of the solar spectrum, plus a low refraction index
- Easier to bond to many elastomers and plastics than other fluorothermoplastics; easily welds to itself
- E-beam curable
- Outdoor weatherability comparable to other fluorothermoplastics
- High limiting oxygen index: does not support combustion
Polyvinylidene fluoride (PVDF) is ideal for multiple applications across a wide array of industries. Widely used in the chemical process industry, wire and cable industry, semiconductor industry, and oil and gas industry, PVDF is also being used in automotive, building and electronics applications.

Dyneon PVDF is characterized by the following features:

- High mechanical strength
- Excellent resistance to aging
- Good flame rating
- Low permeation
- Excellent UV radiation resistance

**Recommended Applications**

**PVDF Homopolymers:**

- High mechanical strength
- Chemical processing components
- Pipes
- Fittings
- Flanges
- Valve components

**PVDF Copolymers:**

- Plenum data communication cable applications
- Cable jacket
- Loose tube
- Tight buffer
**We have technical service down to a science.**

Whatever your process, product or application, our experienced technical service team is on hand to help you make the most of it. From choosing the right polymer to optimizing efficiency, we will provide expert support to help you solve your toughest challenges. Together, we'll find the best parameters for your finished product in order to optimize rate, runtime and yield – whatever your challenge may be.

**Property Overview Fluorothermoplastics**

**3M™ Dyneon™ Fluoroplastic PVDF**

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<td>Homopolymer Poly (VF2) 6000 Series</td>
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<td>CTFE Copolymer VF2 - CTFE 30000 Series</td>
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**3M™ Dyneon™ Fluoroplastic THV, ETFE, FEP and PFA**

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More options. More answers.

Tanks, tubes, pumps, valves, wire and cable, semiconductor equipment, architecture ... the possibilities are virtually endless. Whatever your application, you'll find a material solution in our comprehensive portfolio of 3M™ Dyneon™ Fluoroplastics.

Our broad range of products offer exceptional heat and chemical resistance, excellent weathering features, low permeability, very good electrical properties and more – to help protect your most valuable assets. In addition, our FLEX and UHP grades offer extra flexibility and high purity to further broaden the scope of application.

And every step, our expert technical and sales support teams will be there to help you get the most benefit from our materials.

To our customers

For technical information and additional details, please see the Product Comparison Guide in the pocket on the opposite page. The guide can also be downloaded from our website: www.dyneon.eu/brochures.
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General recommendations on health and safety in processing, on work hygiene and on measures to be taken in the event of accident are detailed in our “safety data sheets (SDS).”

You will find further notes on the safe handling of fluoropolymers in the brochure “Guide for the safe handling of Fluoropolymers Resins” by PlasticsEurope, Box 3, B-1160 Brussels, Tel. +32 (2) 676 17 32.

The present edition replaces all previous versions. Please make sure and inquire if in doubt whether you have the latest edition.